Comparison of Ancient and Modern Cyanobacteria in Three Dimensions Using Confocal Laser Scanning Microscopy

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The Confocal Laser Scanning Microscope (CLSM) has long been used in biology to create three-dimensional images of modern microorganisms. Although a handful of authors over the last decade have utilized it in the field of micropaleontology, no detailed studies exist of its potential and limitations in examining the Precambrian fossil record. Here we present the results of studies of cyanobacterial fossil specimens from the ~850 Ma-old Bitter Springs, and the ~650 Ma-old Chichkan Formations in thin section, using confocal microscopy to create detailed three-dimensional virtual images of morphologies. These results are compared to those achieved when examining morphologically similar modern cyanobacteria. A preliminary quantification of the usefulness of CLSM with respect to the depth of a fossil below the surface of a thin section, the effects of mineral composition on the images acquired, and the extent of degradation of fossils analyzed, is presented.